



1972

## The relationship between the position of the shot and the flight of the rebound in a basketball game

Thomas J. Jones  
*University of the Pacific*

Follow this and additional works at: [https://scholarlycommons.pacific.edu/uop\\_etds](https://scholarlycommons.pacific.edu/uop_etds)



Part of the [Sports Studies Commons](#)

---

### Recommended Citation

Jones, Thomas J.. (1972). *The relationship between the position of the shot and the flight of the rebound in a basketball game*. University of the Pacific, Thesis. [https://scholarlycommons.pacific.edu/uop\\_etds/1769](https://scholarlycommons.pacific.edu/uop_etds/1769)

This Thesis is brought to you for free and open access by the Graduate School at Scholarly Commons. It has been accepted for inclusion in University of the Pacific Theses and Dissertations by an authorized administrator of Scholarly Commons. For more information, please contact [m gibney@pacific.edu](mailto:m gibney@pacific.edu).

THE RELATIONSHIP BETWEEN  
THE POSITION OF THE SHOT AND  
THE FLIGHT OF THE REBOUND  
IN A BASKETBALL GAME

---

A Thesis  
Presented to  
the Faculty of the Department of Health,  
Physical Education and Recreation  
University of the Pacific

---

In Partial Fulfillment of  
the Requirements for the Degree  
Master of Arts

---

by  
Thomas J. Jones  
August 1972

This thesis, written and submitted by

THOMAS JONES

is approved for recommendation to the Committee  
on Graduate Studies, University of the Pacific.

Department Chairman or Dean:

DR. CEDRIC W. DEMPSEY

Thesis Committee:

James S. Ostermeyer (B.S.) Chairman

Glen R. Allbaugh

Dr. Thomas

Dated

July 19, 1972.

# TABLE OF CONTENTS

	Page
LIST OF TABLES . . . . .	iv
LIST OF FIGURES . . . . .	v
Chapter	
1. ORIENTATION TO THE STUDY . . . . .	1
The Purpose of the Study . . . . .	1
THE PROBLEM . . . . .	1
Importance of the Study . . . . .	2
SCOPE AND DELIMITATIONS . . . . .	3
Scope of the Study . . . . .	3
Delimitations of the Study . . . . .	4
Limitations . . . . .	4
THE HYPOTHESIS . . . . .	5
DEFINITION OF TERMS . . . . .	5
Defensive Rebound . . . . .	5
Flight of the Rebound . . . . .	6
Offensive Rebound . . . . .	6
Rebound . . . . .	6
Shooting Area . . . . .	6
Strong Side . . . . .	6
Weak Side . . . . .	6
2. REVIEW OF LITERATURE . . . . .	7
INTRODUCTION . . . . .	7

Chapter	Page
LITERATURE ON THE SKILL AND TECHNIQUE INVOLVED WITH REBOUNDING . . . . .	8
RESEARCH, RELATED TO THE DIRECTION OF THE REBOUND . . . . .	10
TRENDS . . . . .	14
3. METHODS AND PROCEDURES . . . . .	16
THE SUBJECTS . . . . .	16
METHODS USED FOR RECORDING SHOTS AND REBOUNDS . . . . .	17
The Chart . . . . .	17
Statisticians . . . . .	22
Shots Recorded . . . . .	22
Games Observed . . . . .	23
ANALYSIS OF DATA . . . . .	24
Statistical Instrument . . . . .	24
4. THE RESULTS . . . . .	28
DISCUSSION . . . . .	37
SUMMARY . . . . .	40
SUGGESTIONS FOR FURTHER RESEARCH . . . . .	41
BIBLIOGRAPHY . . . . .	44
APPENDIX A . . . . .	46
APPENDIX B . . . . .	51

# LIST OF TABLES

Table	Page
I. Results of the chi square and percentage comparisons between shot areas and rebound areas, for the high school sophomore team . .	30
II. Results of the chi square and percentage comparisons between shot areas and rebound areas, for the high school varsity team . . .	31
III. Results of the chi square and percentage comparisons between shot areas and rebound areas, for the junior college team . . . . .	32
IV. Results of the chi square and percentage comparisons between shot areas and rebound areas, for the university team . . . . .	35
V. Results of the chi square and percentage comparisons between shot areas and rebound areas, for all players combined . . . . .	36
VI. Shot and rebound results for the high school sophomore team . . . . .	46
VII. Shot and rebound results for the high school varsity team . . . . .	47
VIII. Shot and rebound results for the junior college team . . . . .	48
IX. Shot and rebound results for the university team . . . . .	49
X. Shot and rebound results for all players combined . . . . .	50

## LIST OF FIGURES

Figure	Page
1. The Rebound Area Chart . . . . .	18
2. Example of a Work Sheet used during actual games . . . . .	20
3. Basic chart design for presenting raw data, chi square results and percentage frequencies . . . . .	25
4. Actual Work Sheet used during a high school sophomore team game . . . . .	52
5. Actual Work Sheet used during a high school varsity team game . . . . .	53
6. Actual Work Sheet used during a junior college team game . . . . .	54
7. Actual Work Sheet used during a university team game . . . . .	55

## Chapter 1

### ORIENTATION TO THE STUDY

Due to the ever increasing skills of the players, the game of basketball has become more competitive every year. Because of this, greater attention must be given to basic skill techniques required to play the game.

In a basketball game, three areas are considered crucial: shooting, defense, and rebounding. For a team to defeat its opponent, it is essential to control at least two of these three areas.<sup>1</sup>

#### The Purpose of the Study

The purpose of this study was to observe rebounding tendencies as related to the area on the basketball floor where a shot was taken and the direction which the rebound traveled.

### THE PROBLEM

Basketball statistics showed that missed shots provide for more possession changes than by any other factor. Thus, offensive and defensive rebounding must be given

---

<sup>1</sup>Statement by Richard Edwards, personal interview, June 30, 1971.



considerable attention in coaching.<sup>2</sup> Bush<sup>3</sup> felt that basketball teams that were able to dominate rebounding play win nine-tenths of their games. Since rebounding is an important element in winning, it would help to know the probable angles by which rebounds carom off the rim and backboard.<sup>4</sup> Rebound angles depend upon the spot on the floor from where the shot was taken, from where it hit the backboard or rim, and the arc of the shot.<sup>5</sup> With these elements considered, it was questioned as to what degree the actual shooting position influenced the flight of the rebound. Did the position on the basketball floor from where a shot was taken affect where the rebound from that shot would fall?

#### Importance of the Study

If a pattern was established between the position from which a shot was taken and the direction of the rebound, such a pattern might be a determining factor in strategy and technique used by the rebounder. If no pattern was established, the shooting position would have little relationship to the rebound direction.

---

<sup>2</sup>John R. Wooden, Practical Modern Basketball (New York: Ronald Press Co., 1966), p. 212.

<sup>3</sup>Jerry Bush, "Rebounding," Athletic Journal, XXXVIII:2 (October, 1957), p. 6.

<sup>4</sup>Wooden, op. cit., p. 214.

<sup>5</sup>Ibid.

By knowing the probable flight of the rebound, defenses could be arranged to position the best rebounder in the area where the highest percentage of rebounds would fall. Gideon<sup>6</sup> showed that between fifty to sixty percent of the shots taken from one side of the floor landed in a rebound area on the opposite side of the goal, suggesting that a zone defense might be arranged to consistently force the team with the ball to one side of the floor. The strongest rebounder on the defensive team then played the position closest to the predicted rebound area.<sup>7</sup>

This was also applicable to man to man defense. A scouting report analyzing the opponents and their offensive plays might aid in defensive assignments. These would be made in relation to where the offensive men moved during their pattern or direction of play.

Data revealing specific rebound tendencies suggested that players move immediately after a shot, directly for rebounds, and only concern themselves with the blocking out of an opponent after they had reached that area.

## SCOPE AND DELIMITATIONS

### Scope of the Study

The basketball teams used for the study included

---

<sup>6</sup>Donald L. Gideon, "Locate the Shot and Control the Boards," Scholastic Coach, 39:2 (October, 1969), p. 18.

<sup>7</sup>Ibid.

four progressive age and skill groups, including a high school sophomore team, a high school varsity team, a junior college team and a four year college or university team.

### Delimitations of the Study

This study did not include data from professional basketball games. It was limited to the four previously mentioned age and skill levels. In spite of this, a wide cross section of player ability was incorporated in the study and it provided a representative sample.

Following the selection of teams, the types of shots to be recorded were chosen. Only two types were used for the study. These shots were the standard one-handed set shot and the one-handed jump shot. Both shots were similar in their delivery and both were taken facing the basket.<sup>8</sup>

### Limitations

There were certain factors that altered shot patterns. The nature of the offensive plays of the four teams observed as well as their opponent's styles of defense limited or increased the number of shots taken.

This study did not take into consideration the arc used on each player's shot. The rebounds of missed shots attempted by a given player tended to follow a definite pattern, depending on spin and trajectory.<sup>9</sup> Also, the

---

<sup>8</sup>See Chapter 3 for the types of shots used in the study.

<sup>9</sup>Bob Cousy and Frank G. Power, Jr., Basketball, Concepts and Techniques (Boston, Mass.: Allyn & Bacon, 1970), p. 105.

probable distance traveled by a rebound is partially determined by the arc of the shot.<sup>10</sup> This arc will differ slightly for each player included in the study. The arc would be different for a 5'10" player as opposed to a 6'10" player. The difference in height may not be measurable yet it could be a factor.<sup>11</sup> Because of the difficulty in measuring this aspect of the shot, it was not included in the investigation.

### THE HYPOTHESIS

Due to the inconsistency in the literature regarding the position on the floor from which the shot was taken and its influence on the direction of the rebound, the following null hypothesis is presented: There is no relationship between the position on the basketball floor from where the shot was taken and the direction in which the rebound traveled.

### DEFINITION OF TERMS

The following list of defined terms has been included to aid the reader in his understanding of the investigation.

#### Defensive Rebound

The act of gaining possession of the ball after a

---

<sup>10</sup>Wooden, op. cit., p. 214.

<sup>11</sup>Statement by Richard Edwards, personal interview, April 6, 1972.

missed shot by an opponent.

### Flight of the Rebound

The direction the ball travels after it has hit the rim or the backboard.

### Offensive Rebound

The act of gaining possession of the ball after a missed shot by a teammate.

### Rebound

A rebound will be considered to be the flight of the ball that has hit the rim or rim and backboard after a shot and proceeded to travel to a certain spot on the floor.

### Shooting Area

The location or position on the floor from where the shot was taken.

### Strong Side

In relation to the basket, the side of the floor from where a shot was taken.

### Weak Side

In relation to the basket, the opposite side of the floor from where a shot was taken.

## Chapter 2

### REVIEW OF LITERATURE

#### INTRODUCTION

During a basketball game, the average fan is so aware of the shooter that he pays little attention to the fight for rebounds.<sup>1</sup> This battle for the rebound involved many basic skills that must be executed properly. "The players who excell in backboard play are those who have spent hours developing the skills which make them great in this department."<sup>2</sup>

It was not until the addition of "big men" into the game, such as George Mikan and Bob Kurland, that people became aware of the importance of rebounding.<sup>3</sup> Wooden<sup>4</sup> thought rebounding to be so important that he stated, "the team that controls the boards usually controls the game."

---

<sup>1</sup>Vince Eldred, "After the Shot," Scholastic Coach, 37:18 (October, 1967), p. 18.

<sup>2</sup>Jerry Bush, "Rebounding," Athletic Journal, XXXVIII:2 (October, 1957), p. 6.

<sup>3</sup>Charles Luce, "A Mechanical Analysis of Jumping in Basketball," Athletic Journal, XLIV:1 (September, 1963), p. 44.

<sup>4</sup>John R. Wooden, Practical Modern Basketball (New York: Ronald Press Co., 1966), p. 404.

Hobson<sup>5</sup> considered rebounding more important than any other fundamental skill. Gideon,<sup>6</sup> Allsen,<sup>7</sup> and Huberty<sup>8</sup> all commented in their studies that board control usually spelled game control.

#### LITERATURE ON THE SKILL AND TECHNIQUE INVOLVED WITH REBOUNDING

Authorities appeared to be in general agreement on the mechanical phase of rebounding. Luce<sup>9</sup> and Davis<sup>10</sup> suggested certain aids for defensive rebounding. They indicated that a player should take a position when the shot is released so he could see his man and the ball on the backboard. After the ball had been located, the player could then turn in front of his opponent to screen him from the ball. Strack<sup>11</sup> supported the techniques of Luce and Davis and he was another

---

<sup>5</sup>Howard A. Hobson, Scientific Basketball (New York: Prentice-Hall, Inc., 1955), p. 87.

<sup>6</sup>Donald L. Gideon, "Locate the Shot and Control the Boards," Scholastic Coach, 39:2 (October, 1969), p. 18.

<sup>7</sup>Dr. Philip E. Allsen, "The Rebound Area," Athletic Journal, XLVIII:1 (September, 1967), p. 34.

<sup>8</sup>Dr. Carl J. Huberty, "Where the Rebounds Fall," Athletic Journal, 51:1 (September, 1970), p. 54.

<sup>9</sup>Luce, op. cit., p. 44.

<sup>10</sup>Robert M. Davis, Aggressive Basketball (West Nyack, N. Y.: Parker Publishing Co., 1969), p. 71.

<sup>11</sup>David H. Strack, Basketball (Englewood Cliffs, N. J.: Prentice-Hall, 1968), p. 28.

advocate of the "blocking out" technique. Eberly<sup>12</sup> tried to develop tall, inexperienced players into good rebounders. He stressed anticipation of the ball, blocking out and legal positioning. Grunska,<sup>13</sup> Bush,<sup>14</sup> and Julian<sup>15</sup> advocated the block out technique. In order to have a wider field of vision on the "weak side," Bush<sup>16</sup> felt that players should concentrate on both their defensive assignments and the flight of the ball.

Rebounding was strongly considered by Wooden.<sup>17</sup> He indicated that more opportunities for possession will be derived from missed shots than by any other means, therefore, offensive and defensive rebounding must receive a good deal of attention. He did not use the block out technique. He believed in having his players merely cut across the opponent's path and then move toward the backboard.

Samaras<sup>18</sup> reiterated Wooden: "Blocking out away from the basket is not always necessary. The first thought

---

<sup>12</sup>Stephen Eberly, "Crash Course for the Inexperienced Big Man," Scholastic Coach, 40:3 (November, 1970), p. 9.

<sup>13</sup>Jerry Grunska, "Four Principles of Effective Rebounding," Scholastic Coach, 28:30 (October, 1958), p. 30.

<sup>14</sup>Bush, op. cit., p. 8.

<sup>15</sup>Alvin F. Julian, Bread and Butter Basketball (Englewood Cliffs, N. J.: Prentice-Hall, Inc., 1960), p. 40.

<sup>16</sup>Bush, op. cit., p. 7.

<sup>17</sup>Wooden, op. cit., p. 212.

<sup>18</sup>R. T. Samaras, Blitz Basketball (West Nyack, N. Y.: Parker Publishing Company, 1966), p. 57.



should be to move into three positions. These positions are near the basket opposite the shot, in front of the basket and near the basket on the side of the shot. The real blocking is done once these positions are secured." In essence, the idea was to have coverage on all sides of the basket. This concept of equal coverage was also considered for offensive play in a study by Sandlin.<sup>19</sup>

Cooper<sup>20</sup> offered support of Wooden's methods. From an offensive standpoint, a rebounder should track the ball visually, in order to determine whether the shot will be directed a certain way. Defensively, he felt that three methods of rebounding could be used. These methods were the "crash," block out, and combination. The crash had players move directly to separate positions close to the basket. The block out referred to positioning oneself in front of the offensive man and screening him away from the basket. In the combination style, the defender would turn and go immediately after the ball, once contact had been made at the "cut off" position.

#### RESEARCH, RELATED TO THE DIRECTION OF THE REBOUND

Little was found relating to the influence of the

---

<sup>19</sup>Fred Sandlin, "Shoot and Rebound Zone Offense," Scholastic Coach, 39:4 (December, 1969), p. 20.

<sup>20</sup>John M. Cooper and Daryl Siedentop, The Theory and Science of Basketball (Philadelphia: Lea & Febiger, 1969), p. 71.

flight and direction of rebounds. Huberty<sup>21</sup> and Eaves<sup>22</sup> felt that the majority of missed shots would rebound to the weak side.

Meyer<sup>23</sup> developed a set of rules for rebounding. Rule number three stated, "We always want the side opposite the shot to be covered by a rebounder." He went further to reveal that statistics indicated ninety percent of offensive rebounds came off the basket or backboard on the side opposite the shot.

Friend<sup>24</sup> advocated no specific pattern of rebounding but advised that at least one player move to the weak side of the basket, where most shots rebound. Cousy<sup>25</sup> was in accord with these theories as he emphasized that most shots rebound to the side of the basket opposite the side from which the shot was taken. Noch<sup>26</sup> stressed an organized game strategy which includes an effort to gain the best possible rebounding percentage but did not disclose his strategy.

---

<sup>21</sup>Huberty, op. cit., p. 95.

<sup>22</sup>Joel Eaves, Basketball's Shuffle Offense (Englewood Cliffs, N. J.: Prentice-Hall, Inc., 1960), p. 6.

<sup>23</sup>Ray Meyer, Basketball as Coached by Ray Meyer (Englewood Cliffs, N. J.: Prentice-Hall, Inc., 1969), p. 34.

<sup>24</sup>John Friend, "Rebounding ABC's," Scholastic Coach, 31:3 (November, 1961), pp. 28, 30, 47.

<sup>25</sup>Bob Cousy and Frank G. Power, Jr., Basketball Concepts and Techniques (Boston, Mass.: Allyn & Bacon, 1970), p. 289.

<sup>26</sup>George D. Noch, "Drills for Successful Rebounding," Athletic Journal, XLVI:3 (November, 1963), pp. 42-43, 55-57.

Studies have been undertaken to determine if there is a way to determine the best rebounding position. Allsen<sup>27</sup> attempted to determine the area on the floor into which the greatest percentage of shots rebounded. He observed thirty-nine games in which 3180 shots were attempted. The data indicated that the optimum rebound area would be a fifteen to eighteen foot radius from the basket. Conclusions drawn from the study were: the most popular shot was the one handed jump shot, shots from the right side of the floor rebounded to the middle or right hand side, shots from the middle of the floor rebounded back towards the middle or right hand side, shots from the left hand side rebounded toward the middle or right hand side, and if a team could control the rebound area with a radius varying between fifteen to eighteen feet from the midpoint of the endline, it would control ninety percent of the rebounds.

Gideon<sup>28</sup> designed a study to determine if pertinent information could be gathered to aid in devising a zone defense. In a study of twenty-five games, at the high school level, 968 missed shots were recorded. Ten zones were placed on the floor. It was shown that between fifty to sixty percent of the shots taken from one side of the floor, landed in the rebound area on the other side of the basket.

---

<sup>27</sup>Allsen, op. cit., pp. 34, 97-98.

<sup>28</sup>Gideon, op. cit., pp. 18-20.

Bryant<sup>29</sup> studied different variations of rebounding, while observing twenty-one varsity high school games. He found variations included in the areas on the floor from where the shot was taken, the distance of the shot, the hand used and whether the shot would return to the shooter. Results indicated that rebounds had a near fifty percent chance of returning to the shooter, blocking out the shooter is important in the recovery of a rebound and following a shot by the shooter is important in recovering a rebound.

Huberty<sup>30</sup> attempted to substantiate statements by basketball coaches as to how the ball bounces off the backboard following a missed field goal attempt. He suggested that it was important to record the lengths of the attempted field goals as well as where the ball landed after it rebounded off the rim or backboard. He observed twenty-eight games in the Big Ten collegiate conference and other schools in the southeast United States. The results showed the average number of "middle"<sup>31</sup> rebounds was less than the average number of both weak and strong side rebounds. With the length of the shot considered, unsuccessful, medium shots caromed to the weak side more often. For long or short shots, weak side rebounds were similar to strong side rebounds. The results from this investigation implied that some general

---

<sup>29</sup>James E. Bryant, "Percentage Rebounding," Athletic Journal, XLVIII:4 (December, 1967), p. 21.

<sup>30</sup>Huberty, op. cit., pp. 54, 94-97.

<sup>31</sup>Huberty devised a chart, divided into three equal areas. Sixty degree angles from the midpoint of the endlines or baseline, defined the boundaries.

notions regarding rebounding need to be qualified. Huberty concluded that positions near the basket on the strong and weak sides of the floor were equally important when a long or short shot was taken, while the weak side position was more important when medium shots were taken. The middle position was considered to be of least importance.

### TRENDS

In analyzing the different skills and techniques stressed by individual coaches, there appeared to be general agreement as to the mechanics of rebounding. The only sharp distinctions arose in regard to blocking out styles as opposed to the style of going directly to the area near the basket.

Some coaches declared that the majority of missed shots will rebound to the side of the basket away from the shot. Various statistics were offered as to the percentage of such shots but there was no unanimous opinion. Some coaches did not indicate percentages and others declined to say where the majority of missed shots would go.

The results of the related studies were in agreement to the importance of controlling the rebounds, but their results tended to be slightly different. Allsen's<sup>32</sup> study reflected a tendency for a majority of the rebounds to go to the right side of the floor. Gideon<sup>33</sup> stated that fifty

---

<sup>32</sup>Allsen, op. cit., pp. 34, 97-98.

<sup>33</sup>Gideon, op. cit., pp. 18-20.

to sixty percent of shots taken, landed on the opposite side of the basket. Huberty<sup>34</sup> tended to support Allsen and Gideon. With the distance of each shot taken into consideration, long and short shots had an equal chance of going to either the strong or weak side. Bryant<sup>35</sup> concluded that at least fifty percent of shots taken would rebound back to the shooter.

---

<sup>34</sup>Huberty, op. cit., pp. 54, 95-97.

<sup>35</sup>Bryant, op. cit., p. 21.

## Chapter 3

### METHODS AND PROCEDURES

#### THE SUBJECTS

Forty-six basketball players from the City of Stockton, California, were used as subjects in this study. The investigator selected these teams because the majority of the players' ages were within a six year age span yet the ages included some of the most rapid periods of adolescent growth and development. The subjects' ages ranged from fifteen to twenty-five years.

The high school sophomore team, from a three year high school, had the lowest skill level of the four teams selected. Some of the team members had some experience at the senior elementary or junior high school level but for some of the members of the team, this was their first experience with an organized basketball team. With little or no previous experience, their skills were not well developed.

The varsity team at the same high school was also made up of players from Stockton. This team had no player over 6'3", but many team members exhibited fine basketball skills and had played together as a team for two years.

The junior college team resembled the high school varsity team in style of play but obvious differences existed.

in the skill levels possessed by the players. The junior college basketball players were generally taller than their high school counterparts and all had been "starters" for high school varsity teams in the junior college district. Many had received honors while playing in high school.

The university team included players from Stockton and other areas of California and competed at a high level of college basketball play. Most of the team members had been an outstanding high school or junior college player and each one had developed a strong control of game skills, due to much practice and experience.

#### METHODS USED FOR RECORDING

##### SHOTS AND REBOUNDS

##### The Chart

A chart was devised in order to record the missed shots taken and their rebound tendencies. The preparation of the chart was influenced by Julian,<sup>1</sup> McGuire,<sup>2</sup> Allsen,<sup>3</sup> and Huberty.<sup>4</sup>

Figure 1 illustrates a division of the basketball key and half-court area into equal quarters. This was

---

<sup>1</sup>Alvin F. Julian, Bread and Butter Basketball (Englewood Cliffs, N. J.: Prentice-Hall, Inc., 1960), p. 43.

<sup>2</sup>Frank McGuire, Defensive Basketball (Englewood Cliffs, N. J.: Prentice-Hall, Inc., 1959), pp. 53-54.

<sup>3</sup>Dr. Philip E. Allsen, "The Rebound Area," Athletic Journal, XLVIII:1 (September, 1967), p. 34.

<sup>4</sup>Dr. Carl J. Huberty, "Where the Rebounds Fall," Athletic Journal, 51:1 (September, 1970), p. 54.



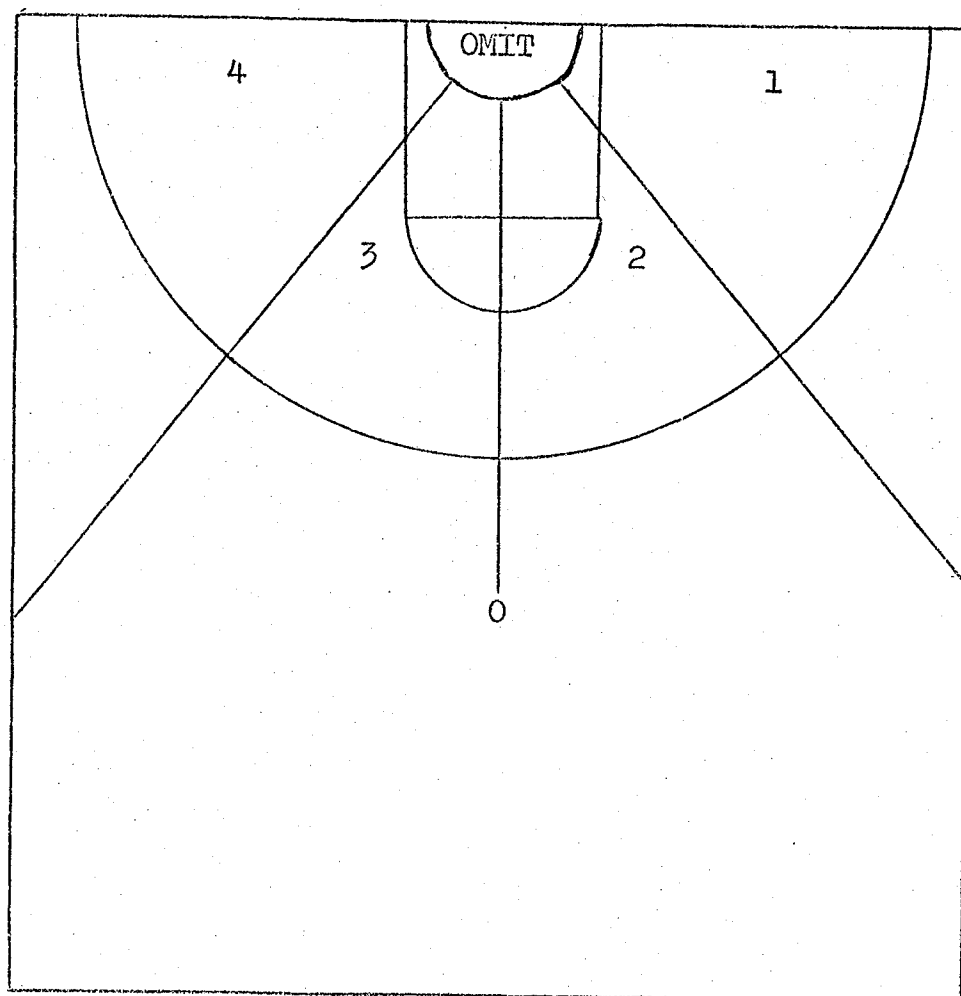


Fig. 1. The Rebound Area Chart

based partly on Allsen's<sup>5</sup> study but also because the baseline or endline is a 180 degree angle and equal quarters would be equal to sections of forty-five degrees. This allowed for the mid-line to be placed at a ninety degree angle. For statistical purposes, the areas were labeled as shown in the illustration. The mid-line was labeled "0" with the area to the far right labeled #1. The area to the right of the mid-line was labeled #2 while the first area to the left of the mid-line was labeled #3. The area to the far left was labeled #4.

In devising this chart, the distance from the basket where the shot was taken was a factor. Shots taken within an area of a five foot radius from the midpoint on the endline were not considered. Many of the shots in this area were very difficult to record accurately due to the closeness of the competing players. Many of the shots taken in this area were of an unorthodox nature and they were not the type of shot desired for the study. Shots taken outside an area of a twenty-five foot radius from the mid-point on the endline were also not considered as that distance was viewed as too far for normal shooting.<sup>6</sup> The area between these two limits formed an area in which most rebounds fell.<sup>7</sup>

Figure 2 illustrates a work sheet used during an

---

<sup>5</sup>Allsen, loc. cit.

<sup>6</sup>McGuire, op. cit., p. 53.

<sup>7</sup>Julian, op. cit., p. 43.

Half \_\_\_\_\_

Half \_\_\_\_\_

Fig. 2. Example of a Work Sheet used during actual games.

Teams \_\_\_\_\_ vs. \_\_\_\_\_

Location \_\_\_\_\_

Date \_\_\_\_\_

Statistician \_\_\_\_\_

Rebound

1	2	3	4

Shot

1	2	3	4

actual game. This chart was selected because standard charts similar in design were used almost universally by teams as a means of gathering game information concerning shooting percentages, shooting tendencies, offensive patterns, and defensive strategies. This prominent use upheld the validity of the chart. It was designed to include information concerning the play of the teams. Both halves of the game were recorded on one sheet. An area was provided to collect and summarize data, where the shots were taken, and where the rebounds landed. The data were accumulated from observations of sixty basketball games. Consequently, reliability was not accurately measured. Within this study, it was almost impossible for two games to be identically duplicated.

A system for recording all shots and rebounds for each game was created. Successful shots were not recorded. The location on the basketball floor from where a shot was attempted was marked in black ink with a number. The same number used for the shot was marked in red ink, on the chart, where the rebound was directed. A rebound was considered to have landed where any player first touched the ball.

The system used for numbering the shots and corresponding rebounds was a progressive type, with the first shot of the game being labeled number one, thus, shot number twenty-five was marked twenty-five on the chart.

Shots were recorded for the entire game. Following each game, forty-five degree angle lines were drawn onto the work sheet. The statistics were then reviewed and compiled as shown in Figure. 2.

### Statisticians

Three statisticians were involved in the recording of data for the study. Although the procedure for recording the shots and their rebounds was rather simple, the statisticians were trained as to exactly what was to be recorded and how it was to be recorded. In this manner, consistency in recording data was maintained.

The statisticians included a high school student, a college senior, and the investigator. The high school student was assigned to observe all games played by both high school teams. The investigator observed all junior college and university games while the college senior was used as a substitute, who recorded the data only when one of the other two statisticians was unable to attend a certain game. The number of statisticians was kept small so that their individual interpretation of the data would not be a great factor. In order to derive the objectivity of the statisticians, a correlation of results of the investigator and the statistician of the same game was calculated. An  $r^8$  of .934 was attained for the shots while an  $r$  of .949 resulted for the rebounds.

### Shots Recorded

As stated earlier, only jump shots and set shots, with the shooter facing the basket, were recorded. These

---

<sup>8</sup>The statistical symbol for the Pearson product-moment coefficient of correlation.

shots were chosen because seven out of every ten shots taken, in modern basketball, are jump shots.<sup>9</sup> The set shot closely resembles the jump shot and was, therefore, included. Only shots taken by right-handed players were recorded.

Certain factors were considered by the statisticians. They were not to record any "hook" shots or any unorthodox shot close to the basket. This would include "scoop" shots, underhanded shots, twisting "turn around" shots, or any "layups." These shots involved different spin, release, and trajectory. The shooter did not necessarily have to face the basket and the skill techniques for these shots differed from the jump and set shots. For a shot to be recorded, it had to hit the rim or the rim and then the backboard. Shots that did not hit either the rim or the rim and backboard were not considered to be rebounds and were not included. Lastly, any shot where a player was fouled in the act of shooting was not recorded.

#### Games Observed

Statistics were taken only during the respective teams league games, with the exception of two games played by the high school varsity team in a post-season tournament. The league games were in a double round-robin style. Each team in a given league played every other team in the league twice.

---

<sup>9</sup>Statement by Stan Morrison, personal interview, April 12, 1972.

## ANALYSIS OF DATA

The data were analyzed to determine if a relationship existed between the area from which a shot was taken and the rebound direction. The frequencies of missed shots originating from certain shooting areas and their corresponding rebound areas were measured.

The data were arranged in five separate categories.

The categories considered were:

1. High school sophomore players,
2. High school varsity players,
3. Junior college players,
4. University players,
5. All players combined.

The data were arranged in a design similar to the chart shown in Figure 3.

### Statistical Instrument

The data were tested for significance through the chi square statistical technique.<sup>10</sup> A significant chi square indicated that shot-rebound tendencies in this study differed significantly from expected shot-rebound tendencies. All values were tested for significance at the .05 level of significance, with nine degrees of freedom. A chi square greater than 16.92 indicated significance at the .05 level of significance. If the results were significant, the null hypothesis

---

<sup>10</sup> Janet T. Spence, Elementary Statistics (New York: Appleton-Century-Crofts, 1968), p. 196.

		REBOUND AREA			
		1	2	3	4
SHOT AREA	1				
	2				
	3				
	4				

Fig. 3. Basic chart design for presenting raw data, chi square results, and percentage frequencies.



was rejected at the .05 level.

Subsequent analysis of the data attempted to assess the probability of each shot rebounding in a certain direction. This was done through a simple percentage comparison. The total number of rebounds falling into each area was calculated and an appropriate percentage of the total shots was also calculated. By utilizing these percentages, it was determined where shots from each section fell the greatest number of times, as well as the second, third, and fourth greatest number of times.

In addition, the percentages of rebounds going to the middle areas were compared to those that fell to their adjacent side areas. The single highest percentage area and the lowest single percentage area were determined.

The formula for determining  $\chi^2$  or chi square was:

$$\chi^2 = \sum \frac{(O - E)^2}{E}$$

where    O = the observed frequency  
           E = the expected frequency  
            $\Sigma$  = the sum of the observed frequency  
                      minus the expected frequency  
                      squared and divided by the expected  
                      frequency.

The expected frequency was determined by the following form. An example would be to find the expected frequency in the X marked box.

$$E = \frac{(\text{total from shot area 3}) \times (\text{total from rebound area 2})}{T (\text{total of all shots taken})}$$

## REBOUND AREA

total		1	2	3	4
XXX SHOT AREA	1				
	2				
	3		X		
	4				
		XXX		total	

## Chapter 4

### THE RESULTS

A total of 1506 missed shots were recorded for the study. The high school sophomore team and varsity team, the junior college, and university teams accounted for 436, 532, 322, and 216 missed shots respectively.

Tables I through V indicate the results of the chi square calculations and the percentage comparisons between shot areas and rebound areas. For all teams individually and combined, the results of the chi square proved to be significant for all groups with the exception of the university team. With a score of 16.92 needed at the .05 level of significance, the university team achieved a score of 11.01. Significance was attained for the high school sophomore team with a score of 35.66, the high school varsity team with a score of 25.73, and the junior college team with a score of 33.02. The chi square calculation for all players revealed a score of 75.37. The significant results meant that the direction of the rebound was related to the position on the floor from which the shot was taken.

For the high school sophomore team, a comparison of the percentages of rebounds from each shot area revealed certain tendencies. Shots taken and missed from area one and four tended to rebound either across the basket to the

other side or to the middle two areas rather than rebound directly back to the area from which the shot was taken. (see Table I) However, a large percentage of missed shots taken from areas two and three tended to rebound back to these areas (65.08%). The chances of a missed shot coming directly back to the area from which the shot was taken were the highest in areas two and three (30.1 and 30.97%). The highest single area for rebounds was from shots taken from area four. Almost 43 percent of the missed shots taken here were directed to area one.

The rebound tendencies of the high school varsity team resembled the sophomore group in many ways, but there were also a few noticeable differences. Missed shots from area four caromed to area one the greatest percentage (32.9%); however, area one had most of its missed shots rebound almost equally to both areas one (27.5%) and two (29.4%). Areas two and three had a large proportion of missed shots return to the middle areas (60.9 and 63.8%) but there was a slight trend for missed shots from the right side of the floor to go to the left side and missed shots from the left side of the floor to go to the right side. The chances of a missed shot coming directly back to the area from which the shot was taken were the highest in area three (31.9%), but the highest single area for rebounds was from shots taken in area two, where almost 36 percent of the missed shots landed in area three (see Table II).

The junior college team had results that differed greatly from both of the high school teams (see Table III).

TABLE I. Results of the chi square and percentage comparisons between shot areas and rebound areas, for the high school sophomore team.

		REBOUND AREA			
		1	2	3	4
SHOT AREA	1	2.408	.144	1.695	9.991
	2	.757	.018	2.590	1.238
	3	.262	.703	.722	2.228
	4	9.316	1.989	.952	.644
		12.743	2.854	5.959	14.101
		$\chi^2 = 35.657$			

		REBOUND AREA			
		1	2	3	4
SHOT AREA	1	20	31.2	20.8	28
	2	22.58	30.1	35.5	11.8
	3	24.78	33.62	30.97	10.6
	4	42.85	21.9	21.9	13.3
		27.29	29.35	26.83	16.51

TABLE II. Results of the chi square and percentage comparisons between shot areas and rebound areas, for the high school varsity team.

		REBOUND AREA			
		1	2	3	4
SHOT AREA	1	.03	.90	1.23	.00
	2	2.32	.01	2.63	.00
	3	.38	1.96	1.08	4.14
	4	2.29	4.43	1.06	3.27
		5.02	7.30	6.00	7.41

$$\chi^2 = 25.73$$

		REBOUND AREA			
		1	2	3	4
SHOT AREA	1	27.5	29.4	22.5	20.6
	2	18.5	25	35.9	20.7
	3	23.8	31.9	31.9	12.4
	4	32.9	17.1	22.8	27.2
		26.7	25.6	27.1	20.6

TABLE III. Results of the chi square and percentage comparisons between shot areas and rebound areas, for the junior college team.

		REBOUND AREA			
		1	2	3	4
SHOT AREA	1	.01	.00	4.10	1.28
	2	1.44	5.87	.06	.24
	3	.77	1.36	12.69	.41
	4	1.95	.73	2.07	.04
		4.17	7.96	18.92	1.97

$$\chi^2 = 33.02$$

		REBOUND AREA			
		1	2	3	4
SHOT AREA	1	34.1	13.8	6.4	45.7
	2	24.1	25.9	15.5	34.5
	3	26.7	8.3	31.7	33.3
	4	40.9	10.9	10.9	37.3
		33.2	14.0	14.3	38.5

Shots taken and missed from areas one and four tended to rebound across the basket to the other side the greatest percentage (45.7 and 40.9%) while they came directly back to the area of the shot the second greatest percentage of times (34.1 and 37.3%). From areas two and three, missed shots caromed most often into area four (34.5 and 33.3%). In areas two and three, the second greatest number of shots had their rebounds come directly back to the area from which the shot was taken (25.9 and 31.7%). From all four areas, the majority of the rebounds landed in areas one and four, 69.15 percent of the time. The chances of a missed shot coming directly back to the area from which the shot was taken were the highest in area four (37.3%). The highest single area for rebounds was from missed shots taken from area one where 46 percent of the rebounds landed in area four.

The university team's results resembled the junior college results in some aspects. Missed shots taken from areas one and four had very large percentages of rebounds carom into these side areas (74.3 and 76.5%). Missed shots from areas one and four traveled across the basket to the opposite side the greatest percentage of times (40.5 and 38.3%) and they rebounded directly back to the shooting area the second greatest percentage (33.8 and 38.2%). Missed shots taken from area two tended, slightly, to go to areas one and four (52%) more often than to areas two and three. Shots taken and missed from area three also rebounded to the



sides more often (63.9%) than to the middle areas. From all four areas, the majority of the rebounds again landed in areas one (34.7%) or four (36.1%). The chances of a missed shot coming directly back to the area from which the shot was taken were highest in area four (38.2%). The highest single area for rebounds was from missed shots taken from area one where 40.5 percent of the rebounds landed in area four.

The combined results for all players revealed a distinctly different pattern from the other individual teams (see Table V). Missed shots taken from areas one and four rebounded directly across the rim to the opposite side the greatest percentage of times (31.2 and 38.1%); however, they rebounded directly back to the shooting area the second greatest percentage of times (27.8 and 28.4%). From areas two and three, missed shots tended to rebound back to these middle areas (57.1 and 56.8%) more often than to areas one and four (42.9 and 43.2%). Missed shots taken from area three had the greatest chance of returning to the shooter (30.5%). The highest single area for rebounds was from missed shots taken from area four. From this area, 38 percent of the rebounds landed in area one.

The tendencies shown in this combined category indicated that missed shots from the side areas, one and four, caromed to these side areas more often (59 and 66.5%) than to the middle areas (41 and 33.5%) and missed shots attempted from the middle areas, two and three, rebounded back to the

TABLE IV. Results of the chi square and percentage comparisons between shot areas and rebound areas, for the university team.

		REBOUND AREA			
		1	2	3	4
S H O T  A R E A	1	.01	1.18	.00	.40
	2	.82	.20	3.26	.45
	3	.02	.83	.11	.69
	4	.29	.03	1.62	.10
		1.14	3.24	4.99	1.64
		$\chi^2 = 11.01$			

		REBOUND AREA			
		1	2	3	4
S H O T  A R E A	1	33.8	5.4	20.3	40.5
	2	24	12	36	28
	3	36.1	13.9	22.2	27.8
	4	38.3	9.9	13.6	38.2
		34.7	9.3	19.9	36.1

TABLE V. Results of the chi square and percentage comparisons between shot areas and rebound areas, for all players combined.

		REBOUND AREA			
		1	2	3	4
SHOT AREA	1	.39	.16	4.71	5.62
	2	5.50	1.86	7.57	1.87
	3	1.32	2.98	7.53	8.88
	4	11.66	8.58	5.23	1.51
		18.87	13.58	25.04	17.88
		$\chi^2 = 75.37$			

		REBOUND AREA			
		1	2	3	4
SHOT AREA	1	27.8	22.7	18.3	31.2
	2	21.6	25.8	31.3	21.3
	3	25.9	26.3	30.5	17.3
	4	38.1	15.4	18.1	28.4
		29.4	21.9	23.2	25.5

middle areas more frequently (57.1 and 56.8%) than to the side areas (42.9 and 43.2%).

### DISCUSSION

The two high school teams, although similar to each other in shot and rebound tendencies, differed greatly from the junior college and university teams. Reasons for these similarities and differences may be found by analyzing such factors as types of offenses, styles of play and the size and quality of the players.

The high school sophomore and varsity teams both used a very similar offensive system. This system tended to produce shots from certain spots on the floor. Both teams also faced zone defenses but the sophomore team was confronted with them more often than the varsity team. It was the opinion of the investigator that the varsity team had the more talented players of the two teams but both teams had similar styles of play. The offensive patterns of these two teams were related and both teams attempted to play their games at a fast tempo. It is possible that the similarity in styles of play of these two teams influenced the resulting shot and rebound patterns.

The junior college team had players with greater size and they were more highly skilled than either of the two high school groups. The junior college team in this study played a style of game that had its own unique characteristics. The team utilized a full court press and

moved the ball down the floor at a very rapid pace. Their objective was to get the ball into shooting position faster than the opposition could organize its defense. As for the offensive aspect, the junior college players were more experienced shooters than the high school players but by the nature of their "running" game many shots resulted from the fast break and from offensive rebounds of these shots. Many of these attempts were hurried and players shot slightly off balance or they "drifted" upon release of the ball. If the junior college team was forced to slow the tempo of the game down, they had a simple offense, designed to get a "good" shot at the first possible chance. The type of offense used was completely different from the one used by the high school teams.

The university team had players who possessed excellent basketball skills. The team had tall, agile players who were the most skilled group in the study. The type of game they played was one in which mainly "high percentage" shots were taken. These shots were created from the proper execution of offensive plays. Often, if a shot did not result from a pattern, the players would return to their original starting positions and run another play. The shots attempted by these players were almost always taken with good form. Players were on balance and used proper touch and release technique. Because these players were older and had played more years, they had also practiced their shooting more. It would seem possible that because of this,

they would have also been better shooters than those of the other groups. With the highly skilled players, the set offensive patterns and the shooting of "high percentage" shots from these patterns, it is the opinion of the investigator that these reasons made the university results differ from the other teams in the study. The high degree of specialization influenced or controlled the results.

The study has presented different results for each age group. These results have been attributed to distinct characteristics of each team such as ability of the players, size of the players, type of offense, style of play, and shooting technique. Due to these factors, an assessment of the total shots taken gave the best description of the direction rebounds travel. The writer is aware that inferences from combined data are limited by the fact that such data are merely composites of independent group data and are not necessarily representative of any specific group.

Within the limitations of this study, it seems reasonable to conclude that there is a relationship between the position on the basketball floor where the shot was taken and the direction or flight the rebound will travel. This relationship was discussed in terms of areas rather than single shooting positions. The relationship established indicated that shots taken from the side court areas had a slightly greater tendency to rebound to side areas while shots taken from the middle areas tended to rebound slightly more to the middle areas.

## SUMMARY

The study was planned to determine whether the position on the basketball floor where a shot was attempted, had a relationship on the direction of a corresponding rebound.

Subjects for this present study were members of four different basketball teams. The selection of the teams was based on age and skill levels. Each team represented a different level. The most unskilled level was represented by a high school sophomore team. The next three higher skilled levels were represented by a high school varsity team, a junior college team, and a university team.

In an attempt to limit outside factors, all games used in collecting data, with the exception of two high school varsity games, were league games. By selecting league games, influences such as familiarity of opponents, variations in officiating the use of a standardized basketball and knowledge of different gymnasiums or arenas were relatively consistent. The exact type of shot to be recorded was determined to be a set shot or a jump shot, with the shooter facing the basket. The set shot and the jump shot were both similar and they were the most popular shots used by all players. The length of shots taken was also noticed. Shots taken within five feet of the basket or further than twenty-five feet from the basket were not recorded. "Hook" shots, "layups," or any other "unorthodox" shots were not recorded.

For the recording of the data, statisticians were trained as to what kind of shot was to be recorded and how these shots were to be marked. Standard work sheets were devised for the desired information. Shot areas were marked with black ink while rebound areas were marked with red ink. Each missed shot was given an identification number. The corresponding rebound was given the same number. The results were always tabulated by the investigator.

A review of the related literature was completed. Studies and opinions of professional coaches and associates were presented.

After the data were collected, they were summarized and then measured for significance at the .05 level of significance. This was done by the chi square statistical technique. Data for the university team did not reach significance. The results for all other categories proved to be significant. Therefore, the null hypothesis was rejected at the .05 level for all groups with the exception of the university team. In addition, the data for all groups were computed for percentage relationships between shooting areas and rebound areas. These percentages were used to compare the side areas and the middle areas where certain tendencies were noticed.

#### SUGGESTIONS FOR FURTHER RESEARCH

Using the same basic plan of investigation, further studies along similar routes should be taken. A similar



study using more teams may reveal more accurate data. A problem seen immediately would be the recruitment of more competent statisticians. Since additional observers would be needed, factors of individual judgment might bias the recording of data.

A parallel study involving professional basketball would be interesting. Since the highly skilled university team's results did not reach significance, how would the professional team's results compare? A study of this type would include the most highly skilled players.

Right-handed versus left-handed shooting might also be considered. Although a great majority of the population is right-handed, there is a minority of left-handed people, which includes basketball players. Could the fact of being left-handed influence the spin of a shot? In Bryant's<sup>1</sup> study, which was reviewed in chapter two, it was stated that the ball will rebound away from a right-handed shooter 48 percent of the time while a left-handed shooter had the ball rebound away from him 58 percent of the time. With Bryant's study taken into consideration, left-handed players might well influence rebounding tendencies of missed shots.

A study of a similar nature but one employing a different type of shot, could be conducted. "Hook" shots or "layups" could be observed. Difficulties here may include the fact that not many players use "hook" shots. Also, due

---

<sup>1</sup>James E. Bryant, "Percentage Rebounding," Athletic Journal, XLVIII:4 (December, 1967), p. 21.

to the closeness to the basket in which a "layup" is taken, it would be extremely difficult to chart this shot and rebound accurately.

It was the intent of the investigator to provide data which would display a relationship between the missed shot and its rebound. With the data presented in the study, it was hoped that the information could be used as a logical base for future coaching technique and theory.

## BIBLIOGRAPHY

## BIBLIOGRAPHY

### A. BOOKS

- Cooper, John M., and Daryl Siedentop. The Theory and Science of Basketball. Philadelphia: Lea and Febiger, 1969.
- Cousy, Bob, and Frank G. Power, Jr. Basketball, Concepts and Techniques. Boston: Allyn and Bacon, Inc., 1970.
- Davis, Robert M. Aggressive Basketball. West Nyack, N. Y.: Parker Publishing Company, 1969.
- Eaves, Joel. Basketball's Shuffle Offense. Englewood Cliffs, N. J.: Prentice-Hall, 1960.
- Freund, John E. Modern Elementary Statistics. Englewood Cliffs, N. J.: Prentice-Hall, 1960.
- Hobson, Howard A. Scientific Basketball. New York: Prentice-Hall, 1959.
- Julian, Alvin F. Bread and Butter Basketball. Englewood Cliffs, N. J.: Prentice-Hall, 1960.
- McGuire, Frank. Defensive Basketball. Englewood Cliffs, N. J.: Prentice-Hall, 1959.
- Meyer, Ray. Basketball as Coached by Ray Meyer. Englewood Cliffs, N. J.: Prentice-Hall, 1969.
- Russell, William F. Go Up for Glory, ed. William Francis McSweeney. New York: Coward-McCann, Inc., 1966.
- Samaras, R. T. Blitz Basketball. West Nyack, N. Y.: Parker Publishing Company, 1966.
- Spence, Janet T., Benton J. Underwood, Carl P. Duncan, and John W. Cotton. Elementary Statistics. New York: Appleton-Century-Crofts, 1968.
- Strack, David H. Basketball. Englewood Cliffs, N. J.: Prentice-Hall, 1968.
- Wooden, John R. Practical Modern Basketball. New York: Ronald Press, 1966.

## B. PERIODICALS

- Allsen, Philip E. "The Rebound Area," Athletic Journal, XLVIII (September, 1967), 34, 97-8.
- Bryant, James E. "Percentage Rebounding," Athletic Journal, XLVIII (December, 1967), 21.
- Bush, Jerry. "Rebounding," Athletic Journal, XXXVIII (October, 1957), 6-8.
- Eberly, Stephen, "Crash Course for the Inexperienced Big Man," Scholastic Coach, 40:8, November, 1970.
- Eldred, Vince. "After the Shot," Scholastic Coach, 37:18, October, 1967.
- Friend, John. "Rebounding ABC's," Scholastic Coach, 31:3, November, 1961.
- Gideon, Donald L. "Locate the Shot and Control the Boards," Scholastic Coach, 39:2, October, 1969.
- Grunska, Jerry. "Four Principles of Effective Rebounding," Scholastic Coach, 28:30, October, 1958.
- Huberty, Carl J. "Where the Rebounds Fall," Athletic Journal, 51:1, September, 1970.
- Luce, Charles. "A Mechanical Analysis of Jumping in Basketball," Athletic Journal, XLIV (Dember, 1963), 44, 83.
- Noch, George D. "Drills for Successful Rebounding," Athletic Journal, XLIV (November, 1963), 42-3, 55-7.
- Sandlin, Fred. "Shoot and Rebound Zone Offense," Scholastic Coach, 39:4, December, 1969.

## C. INTERVIEWS

- Edwards, Richard. Personal Interview. June 30, 1971.
- Edwards, Richard. Personal Interview. April 6, 1972.
- Morrison, Stan. Personal Interview. April 12, 1972.
- Theimer, William C. Personal Interview. April 13, 1972.

## APPENDIX A

TABLE VI. Shot and rebound results for the high school sophomore team.

		REBOUND AREA				
		1	2	3	4	
SHOT AREA	1	25	39	26	35	125
	2	21	28	33	11	93
	3	28	38	35	12	113
	4	45	23	23	14	105
		119	128	117	72	436

TABLE VII. Shot and rebound results for the high school varsity team.

		REBOUND AREA				
		1	2	3	4	
SHOT AREA	1	44	47	36	33	160
	2	17	23	33	19	92
	3	29	39	39	15	122
	4	52	27	36	43	158
		142	136	144	110	532



TABLE VIII. Shot and rebound results for the junior college team.

		REBOUND AREA				
		1	2	3	4	
SHOT AREA	1	32	13	6	43	94
	2	14	15	9	20	58
	3	16	5	19	20	60
	4	45	12	12	41	110
		107	45	46	124	322

TABLE IX. Shot and rebound results for the university team.

		REBOUND AREA				
		1	2	3	4	
SHOT AREA	1	25	4	15	30	74
	2	6	3	9	7	25
	3	13	5	8	10	36
	4	31	8	11	31	81
		75	20	43	78	216

TABLE X. Shot and rebound results for  
all players combined.

		REBOUND AREA				
		1	2	3	4	
SHOT AREA	1	126	103	83	141	453
	2	58	69	84	57	268
	3	86	87	101	57	331
	4	173	70	82	129	454
		443	329	350	384	1506

## APPENDIX B

The following pages are actual work sheets used by the statisticians while observing the assigned basketball games. These figures include a high school sophomore game, a high school varsity game, a junior college game, and a university game.

Again, as an aid to the reader, all missed shots were marked in black ink while all rebounds were marked in red ink.



Half 2

71

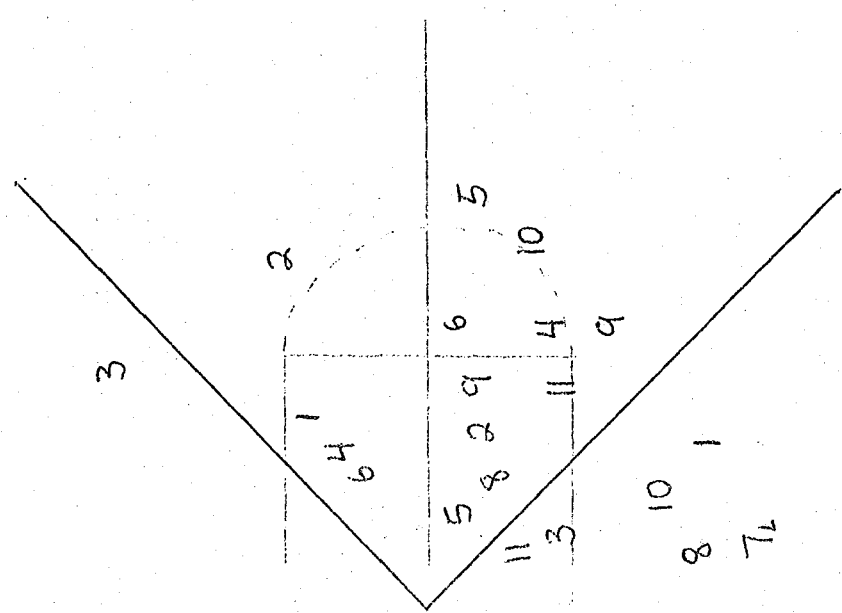
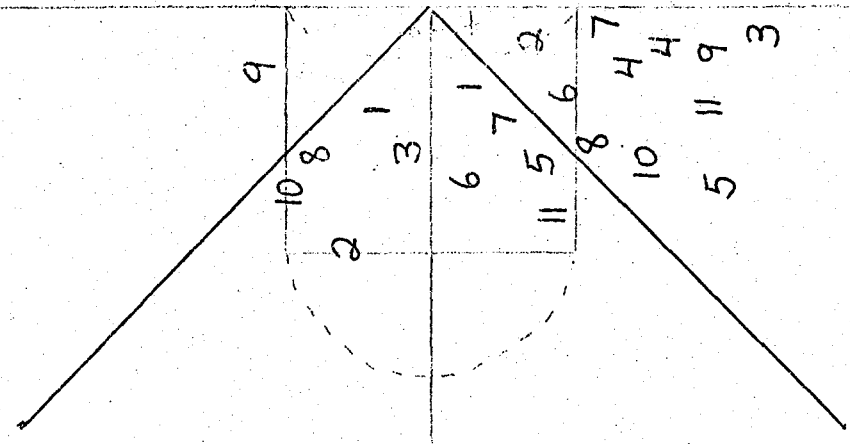


Fig. 5. Actual Work Sheet (varsity team)



Teams: Stagg (varsity) vs. Lodi (varsity)  
 Location: Stagg High School Gymnasium  
 Date: February 25, 1972  
 Scribe: Jeff Fleming

	SHOT					REBOUND				
	1	1	2	1	0	1	2	3	4	
	3	3	3	3	0	3	3	3	3	
	2	1	0	1	0	2	1	1	0	
	3	1	3	2	2	3	3	2	2	
	4	0	1	1	0	4	0	1	0	

leaf  
15  
L

८

4-10-1

**Abstract**

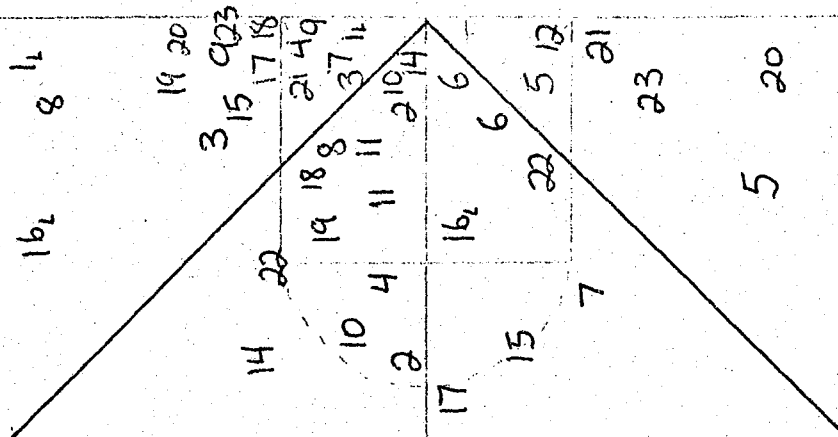
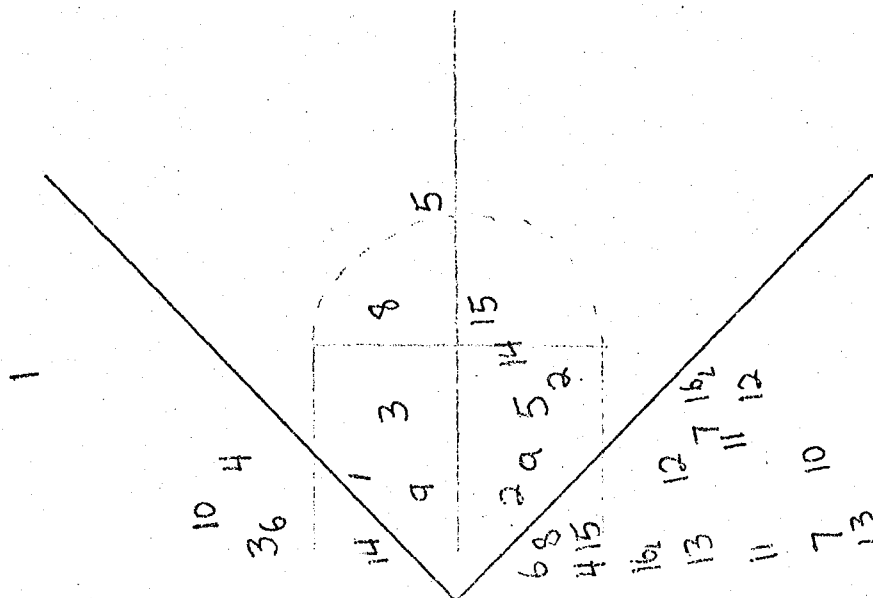


Fig. 6. Actual Work Sheet (junior college team)

100

San Joaquin vs. Cosumnes River College

100

Cosumnes River Gymnasium

20

January 18, 1972

1990

Tom Jones

SHOT	REBOUND
1	2
1	0
2	1
3	2
4	1



